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CERTIFICATE

This certificate is issued in support of an application for Patent registration in a country outside New Zealand pursuant to the Patents Act 1953 and the Regulations thereunder.

I hereby certify that annexed is a true copy of the Provisional Specification as filed on 26 August 2002 with an application for Letters Patent number 520994 made by Craig Bell.

I further certify that pursuant to a claim under Section 24(1) of the Patents Act 1953, a direction was given that the application proceed in the name of NEW ZEALAND DAIRY BOARD.

Dated 15 September 2003.

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NEW ZEALAND

PATENTS ACT, 1953

PROVISIONAL SPECIFICATION

FOOD INGREDIENT, PRODUCT AND PROCESS

I, Craig Bell, Fonterra Research Centre, Dairy Farm Road, Palmerston North, New Zealand do hereby declare this invention to be described in the following statement:

DAIRY INGREDIENT, PROCESS AND PRODUCT

TECHNICAL FIELD

The present invention relates to ingredients useful for making recombined food products.

BACKGROUND ART

It is well known in the art that many foodstuffs can be sold in a form suitable for recombination by the consumer. The consumer benefits from the existence of such recombined products in several ways: they do not need to source each individual component of the product separately, and can make the decision as to when to create the final product (for example by mixing the ingredients, or adding water). This delayed creation of the final product ensures that the product is fresh when the consumer needs it.

The demand for such "instant" foods has led to an increase in vendors using "premix" formulations to provide consumers with fresh recombined foods, the foods being mixed and prepared at the point of sale. Such vendors tend to mix the ingredients using low-tech, yet high intensity mixing devices. An example of such a vendor is a mobile ice cream vendor. The machinery is little more than a facilitator for "an add water and mix" process, but the convenience of being able to produce the ice cream at the point of sale avoids problems such as the need for chilled storage space. Also, the consumer knows

that the product is fresh, as they have literally seen the product being made in their presence.

Pre-prepared foods used by such vendors generally consist of the dry ingredients of the product, with perhaps some fat or oil added to the ingredient mix. Water is usually added at the time the ingredients are put into the mixing machine. After the ingredients are mixed (and if required heated, cooked or cooled), the product is put into containers for use by the consumer.

There are several known methods of producing food products via the recombining route using a range of milk protein ingredients.

Peters & Knoop (1975) conducted experiments to produce Camembert cheese using mixtures of milk powder and milk. Satisfactory cheese was produced using at least 50% fresh milk.

US Patent No. 4,066,791 discloses a method for making recombined cheese where an acidified milk powder was produced initially, whereupon reconstitution with water yielded a milk with a pH between 4.95 and 5.3. The acidified milk was clotted with the addition of a proteolytic enzyme and cut and dewheyed using conventional cheese making arts. The resulting curd was suitable for the manufacture of cottage, bakers', cream, and Neufachatel cheese and quark.

Davis (1980) proposed that cheese (including hard, semi-hard and soft cheese styles) could be produced, without producing whey, from dry ingredients and water, using cream (or milk fat), skim milk powder and caseinate and minor ingredients. Flavour production could be accelerated by the addition of small amounts (< 1%) of matured Cheddar or Parmesan cheese.

Omar & Buchheim (1983) conducted experiments using instant whole milk powder reconstituted to 20% solids to produce soft brine cheese. Whey was produced upon cutting of the curd and one to two months was required for the cheese to ripen.

Gilles (1984) prepared recombined domiati-type cheese using 52% protein skim milk powder and anhydrous milk fat. The hydrated mixture was fermented with appropriate starter strains, renneted and salted. No whey was produced. After maturation, Gilles concluded that an acceptable cheese could be produced.

Christensen (1988) suggested a dry ingredient based process using Ca caseinate, whey powder and melted fat for the production of cream cheese, labneh, feta, domiati, mozzarella cheeses and dips. The ingredients were combined with water in a high-shear steam-heated mixer. Large-scale, semi-continuous production was envisaged.

Ali & Robinson (1990) experimented with the production of feta-style cheese via the recombining route using anhydrous milk fat, skim milk powder and sodium caseinate. Starter culture was used to reduce the pH and metabolise lactose. Rennet was also used.

After salting and ripening for one month, the experimenters concluded that 'despite some limitations in respect of functional properties, the manufacture of a Feta-style cheese by direct recombination is clearly feasible'. Ali & Robinson speculated that the advent of high-protein skim milk powders offered further opportunities.

Cawdron in US 4,388,337 teaches the use of a dry powdered mix containing pectin, starch and food acids for reconstitution with milk to produce a dessert with a smooth gel structure.

Ekanyake et al. in US 6,056,984 disclosed another approach to the use of pre-mixes. This patent describes the use of two pre-mixes, each formulated with compatible ingredients. Each pre-mix differs in water activity such that upon combining a range of products including dough, sauces, dressings, batters and beverages can be produced. This approach utilises careful combinations of ingredients, pH and water activity to confer chemical and microbiological stability within each sachet. Upon breaking the seals between the sachets, the mixes are combined to produce the required product formulation. Low intensity mixing without further addition of water is envisaged and the invention does not relate to protein gels such as cheese products. No cooking step is involved.

It is an object of the present invention to provide an improved or alternative ingredient for the production of recombined food products, and / or to provide an improved or alternative method of producing recombined food products.

SUMMARY OF INVENTION

In one aspect the invention broadly consists in a dry pre-mix formulation for manufacturing a recombined food product, comprising:

- an amount of a milk protein concentrate, and
- an amount of at least one component selected from fat containing powder, whey protein concentrate, whey protein isolate, a solubilised total milk protein, caseinate, milk powder, rennet casein, sweetening agents, vegetable proteins, and starch.

Preferably the pre-mix formulation further includes an amount of at least one component selected from, salt, emulsifying agents, flavouring agents lactose monohydrate, preservatives, hydrocolloids and polysaccharides and salts of phosphate and citrate (melting salts).

Preferred fat containing powders for use in the invention include cream powder and powdered hydrogenated vegetable fat.

Preferred emulsifying agents include lipid and phospholipid derived agents.

More preferably said emulsifying agents are selected from commercial glycerol monostearate and lecithin based formulations.

Preferred flavouring agents include cheese powder, enzyme modified cheese powder, cocoa, coffee, caramel, fruit flavours, and savoury flavours.

Preferred preservatives are selected from sorbic acid and its salts, propionic acid and its salts, benzoic acid and its salts, and nisin.

Preferred hydrocolloids and polysaccharides include locust bean gum, xanthan gum, microcrystalline cellulose (MCC), carboxy-methyl-cellulose (CMC), guar gum, pectin, alginate and carageenan.

Preferably between 42% and 90% of the fat free component of the milk protein concentrate is milk protein.

In a preferred embodiment the milk protein concentrate dry matter protein comprises about 56%, 70% or 85% of the non fat component as milk protein.

Preferably the milk protein concentrate comprises between about 6% to about 80% of the ingredient.

Preferably the milk protein concentrate forms from about 2% to about 40% by weight of the dairy product.

Preferred flavours include cheese, cheesey, savoury, fruity (strawberry), coffee, caramel and chocolate.

Preferably the cream powder comprises about 55% or 70% fat.

Preferably the ingredient is in the form of a powder.

In a second aspect, the invention consists in a method of producing a recombined food product, comprising the following steps:

- combining an amount of a milk protein concentrate, and an amount of at least one component selected from fat containing powder, whey protein concentrate, whey protein isolate, a solubilised total milk protein, caseinate, milk powder, rennet casein, sweetening agents, vegetable proteins, and starch; and
- mixing with an amount of a potable liquid.

In a further aspect, the invention consists in a method of producing a recombined food product, comprising the following steps:

- combining a first dry pre-mix formulation comprising an amount of a milk protein concentrate, and an amount of at least one component selected from, salt, emulsifying agents, flavouring agents, lactose monohydrate, preservatives, hydrocolloids and polysaccharides and salts of phosphoric and citric acids (melting salts) with a second dry pre-mix formulation comprising

an amount of at least one component selected from an acidulent, $CaCl_2$, NaCl, melting salts, flavouring agents and colouring; and

- mixing the dry pre-mix formulations with an amount of a potable liquid.

In a further aspect the invention broadly consists in a method of manufacturing a recombined food product, comprising the following steps:

- adding an amount of a milk protein concentrate and an amount of at least one component selected from fat containing powder, whey protein concentrate, whey protein isolate, a solubilised total milk protein, caseinate, milk powder, rennet casein, sweetening agents, vegetable proteins, and starch to a potable liquid,
- agitating the mixture for a length of time, and
- packaging the recombined food product.

A preferred potable liquid is water.

An alternative potable liquid is milk.

Preferred emulsifying agents include lipid and phospholipid derived agents.

More preferably said emulsifying agents are selected from commercial glycerol monostearate and lecithin based formulations.

Preferred flavouring agents include cheese powder, enzyme modified cheese powder, cocoa, coffee, caramel, fruit flavours, and savoury flavours.

Preferred preservatives are selected from sorbic acid and its salts, propionic acid and its salts, benzoic acid and its salts, and nisin.

Preferred hydrocolloids and polysaccharides include locust bean gum and carageenan.

Preferred acidulents include glucono delta lactone (GLD), lactic acid anhydride, tartaric acid and citric acid.

Alternatively, the first and second dry pre-mix formulations are mixed with a third pre-mix formulation, comprising an amount of at least one component selected from an animal fat (anhydrous milk fat), vegetable fat or vegetable oil, liquid sweetening agents (golden syrup, honey and corn syrup) and flavourings and colouring.

In a further embodiment a fourth pre-mix formulation comprising dry rennet and salt is added.

Preferably the fourth pre-mix formulation is added after the mixture has cooled.

In a further embodiment a fifth pre-mix formulation comprising viable food-grade strains of bacterial cultures, preferably grown and stabilised on skim milk powder, is added.

Preferably said viable food-grade strains of bacterial cultures are freeze-dried or spray-dried lactic cultures.

Preferably the fifth pre-mix formulation is added after the mixture has cooled.

Preferably between 40% and 90% of the non-fat component of the milk protein concentrate is milk protein.

In preferred embodiments the milk protein concentrate non-fat component protein comprises about 56%, 70% or 85% milk protein.

Preferably the milk protein concentrate comprises between about 6% to about 80% of the first ingredient.

Preferably the milk protein concentrate forms from about 2% to about 40% by weight of the food product.

Preferably the flavours for savoury products are cheese-like or meat-like and for dessert and confectionary products are selected from fruit, coffee, caramel and chocolate.

Preferably the cream powder comprises about 35% to 85% fat.

Preferably the first pre-mix formulation is in powder form. Other ingredients may also be in a powder form.

In another aspect milk protein concentrate is substituted by dried skim milk cheese. In this embodiment, the invention broadly consists in a dry pre-mix formulation for manufacturing a recombined food product, comprising:

- an amount of dried skim milk cheese, and
- an amount of at least one component selected from fat containing powder (cream powder, powdered hydrogenated vegetable fat) whey protein concentrate, whey protein isolate, solubilised total milk protein, caseinate, milk powder, sweetening agents, vegetable proteins, and starch.

Preferably the pre-mix formulation further includes an amount of at least one component selected from, salt, emulsifying agents (glycerol monostearate, lecithin), flavouring agents (cheese powder, enzyme modified cheese powder, cocoa, fruit flavours, savoury flavours) lactose monohydrate, preservatives (potassium sorbate, nisin), hydrocolloids and polysaccharides (locust bean gum and carageenan) and salts of phosphate and citrate (melting salts).

The dried skim milk cheese containing ingredient is used in conjunction with the second, third, fourth and fifth ingredients as described above.

A further aspect of the invention comprises a kit comprising one or more of the ingredients useful herein.

DETAILED DESCRIPTION

As mentioned herein, references to "recombined" food products refer to the reconstitution of food products from raw or semi-processed ingredients and pre-mix formulations, where such food products are generally sold as a final product, rather then in ingredient form.

It is understood that although the description of the invention contains references to the addition of dry pre-mix formulations to other dry pre-mix formulations, this does not preclude the possibility that said dry pre-mix formulations are initially mixed and kept in the same bag.

Preferred preservatives are selected from the list of food approved preservatives given by the United States of America Food and Drug Administration list of approved preservatives with GRAS status, or as local regulations apply. A current list of GRAS approved agents is found at http://vm.cfsan.fda.gov/~dms/eafus.html.

Skim milk cheese base is prepared from commercial skim milk cheese by grinding, drying to preferably less than 10% moisture and milling to about 30#. Skim milk cheese is a dairy product with a label of identity defined by the United States of America Code of Federal Regulations CFR21 133.189.

A "milk protein concentrate" (MPC) and a "milk protein isolate" (MPI) are dried sources of casein and whey protein, or a dried blend of proteins that give milk protein concentrate-like properties of heat coagulation and acid coagulation and enzymatic coagulation.

MPC is a dried milk protein product in which preferably greater than 45% of the non-fat component is milk protein. Such concentrates are known in the art. MPCs are frequently described with the non-fat component % as milk protein being appended to "MPC". For example MPC70 is an MPC with 70% of the non-fat component as milk protein. In some documents, MPC and MPI are referred to as retentate powder, ultra filtered milk powder and also concentrated milk powder.

MPC and MPI in the context of this application are considered to be equivalent and further includes the dried product of the ultrafiltration or microfiltration, or combinations of the two, of milk. The performance of MPC or MPI in this invention may be further improved by manipulation of the cation concentrations (specifically the Ca, Mg, Na & K concentrations) by methods known in the art.

MPC and MPI can be further enhanced by the use of whole milk rather than skim milk during ultrafiltration or microfiltration (or combinations of the two) whereupon following drying, a high fat MPC or high fat MPI is obtained. Further enhancements include, but not limited to, blends of milk fat and vegetable oil added during the production of the high fat MPC or MPI. The utility of these high fat MPC and MPI powders is that the

rehydration and ease of producing the required fat dispersion (emulsion) is significantly facilitated. A practitioner skilled in the art will recognise that the proportion of fat or oil in the high fat MPC or MPI can be standardised so as to achieve the required fat content of the final product.

For the purposes of this invention, MPC includes all milk powders with a protein content > 42% on a fat free basis, and includes the option to prepare said powders using skim milk – buttermilk blends of any proportion. This invention also includes the option of preparing MPC and MPI retentates prior to drying, or upon reconstitution with water, where the proportion of particular casein and whey proteins have been selectively manipulated.

MPI refers to a dried milk protein composition comprising of greater than 85% of the non fat component as milk protein. Such isolates are known in the art.

These products differ from milk concentrates in that they are high in protein and low in lactose. They differ from skim milk concentrates in that they are high in protein and low in lactose.

A known use for MPC and MPI is in cheese manufacture. By addition of these to increase the protein concentration of milk used in the manufacture of cheese, cheese making can be made more consistent and more efficient.

A variety of natural cheese, particularly of the unripened short shelf life type, as well as some other dairy products, are made commercially and domestically on almost a daily basis in small batches. These are usually in the order of a kilogram (domestically or in small catering facilities such as restaurants and canteens), or in batches typically of 10 to 100 kg by manufacturers selling into local street markets, as well as by manufacturers in store-in-store outlets, such as are found widely in supermarkets and shopping malls.

Examples of this product variety include fresh white cheese, yoghurt, drinking yogurt, quark (quarg), lebneh, sour cream, whipping cream and cheese spreads. Large-scale semi continuous or continuous production is typically not a feature of these operations. Producers in this market context are concerned with reliable, fast and consistent small-scale production of a standardised product. Typically such operators produce more than one product on any day and require ease of product switching.

We have discovered that the use of MPC or powdered skim milk cheese, mixed with a careful selection of other ingredients confers significant advantages to the users of such manufacturing systems. Of particular advantage is that the quantity of pre-mix can be tailored to the manufacturers' needs on a 'one bag per batch' basis. General formulations are such that product variability is greatly reduced and the tendency to forget to add an ingredient or skimp on high cost components is eliminated. The vendor may use either the whole bag for a batch, or can use a proportion of a bag for lesser volume requirements. There is hence no need to measure proportions of different ingredients when reducing the production size.

Moran *et al.* teaches that rehydrated MPC and fresh cream is easier to convert to a finely dispersed emulsion than the mixing of rehydrated MPC and anhydrous milk fat, vegetable oil or other sources of fat. Surprisingly, we have found that a mixture of MPC and cream powder also provides ease of emulsion formation similar to fresh cream. These processing attributes, together with their dry powder nature, make them very suitable to be formulated into a pre-mix along with other ingredients.

The manufacture of stable pre-mix formulations or blends of ingredients in the same package requires careful manipulation of the water activities of the constituent components. Specifically, the water activities need to be controlled such that there is no propensity for water to diffuse to the most hydrophilic of the components causing its deterioration or adverse interaction with other components of the blend. In a particular embodiment of the invention, the incorporation of viable microorganisms and/or enzymes as a component of a pre-mix requires control of the water activity to ensure their storage stability and minimisation of their metabolism of the constituents of the blend. Inert gas may be added to the package to aid storage stability.

Preferably, the particle size of the pre-mix constituents incorporating the MPC, MPI or their high fat equivalents should be consistent with typical spray dried products. This is found to facilitate rapid and uniform rehydration and minimise particle settling or

segregation while the pre-mix is held in storage or in transit. In a preferred embodiment, 99% by weight of the particles of the powder mixture should be < 200 μm.

To provide for the ability to produce a range of cheese, cheese-like products and food products, one or more pre-mix formulations is used in a particular embodiment of the invention.

Minor ingredients with high functional activity such as, but not limited to, powdered food acids and rennet may be added to the mixture at the appropriate stage of the process but the initial high local concentrations can adversely affect the product (e.g. cause protein precipitation) which increases the mixing time to enable reincorporation or results in a degradation of product quality. A specially formulated pre-mix is used to facilitate the dispersion and incorporation of these agents. The ingredients such as powdered food acids and rennet are diluted with relatively inert agents that may include, but not limited to, salt, lactose, MPC, polysaccharide etc. Food acids available in powder form may include, but are not limited to, citric acid, salts of hydrogen phosphate, lactic anhydride (also known as lactide), glucono delta lactone (also known as GDL), and tartaric acid.

As mentioned herein, references to "bags" of pre-mix formulations refer to prepared packages of selected ingredients or combinations of selected ingredients. It is envisaged that other types of containers of ingredients will be equally applicable in the invention.

The first of the bags containing the pre-mix formulation ("Bag 1") contains at least one of, but not limited to, the following ingredients in any proportion: MPC, MPI, cream powder, cheese powder, sodium caseinate, calcium caseinate, whey protein concentrate, whey protein isolate, solubilised milk protein, mono-, di- and polysaccharides, hydrocolloids, antioxidants, emulsifying agents, emulsifying salts, colouring and flavouring agents, and vegetable protein powder, soluble and insoluble oligosaccharides, enzyme modified cheese (EMC) powder and powdered vegetable fat.

The second of the bags containing the pre-mix formulation ("Bag 2") may contain at least one of, but is not limited to, the following ingredients in any proportion: vegetable oil or fat, antioxidants, emulsifying esters and glycerides, oil soluble vitamins, and flavouring agents, and colouring agents. The form of this pre-mix may be block, chip, granular, powdery or finely particulate.

Another of the bags containing a pre-mix formulation ("Bag 3") may contain at least one of, but is not limited to, the following ingredients in any proportion: powdered rennet or suitable para κ-casein forming or casein micelle destabilising enzymes, salt, powdered food acid, vitamins, and a soluble form of calcium.

A further bag containing a pre-mix formulation ("Bag 4") may contain at least one of, but is not limited to, the following powdered ingredients in any proportion: MPC, milk powder and viable food approved strains of microorganisms and/or enzymes, and stabilisers.

Yet another bag containing a pre-mix formulation ("Bag 5") may contain at least one of, but is not limited to, the following ingredients in any proportion: fruit pulps, vegetable pulps, plant extracts, herbs, nuts, spices, honey, golden syrup and corn syrup.

Another of the bags containing a pre-mix formulation ("Bag 6") may contain at least one of liquid rennet and enzymes.

Another of the bags containing a pre-mix formulation ("Bag 7") may contain at least one of, but is not limited to, the following liquid ingredients in any proportion: savoury extracts, fermentation concentrates, and flavour concentrates.

Yet another of the bags containing the a pre-mix formulation ("Bag 8") may contain at least one of, but is not limited to, the following ingredients in any proportion: animal tissue, animal tissue extracts, preservatives and smoke flavours.

It is envisaged that the bags of pre-mix formulations may be composed of constituents that are in themselves blends or combinations of ingredients.

The number of bags of pre-mix formulations required for the manufacture of a particular food product may be as many as eight. However, the usual number would be from two to four bags of pre-mix formulations.

To produce a food product, all or part of the contents of Bag 1, and if required Bag 2, together with the required amount of water (at ambient temperature or heated) are placed in a high shear mixer. Mixing is commenced and continued until the proteins are fully dispersed. Heat is applied indirectly through the wall of the vessel and/or directly, such as via the admission of culinary steam. Any desired temperature up to the boiling point of the mixture may be attained but at least 72°C is preferred. The optimum heating/cooking temperature is held to attain the required protein restructuring, emulsification or pasteurisation conditions, whichever is the longer. If no further ingredients are to be added, the product may be poured into vessels for sale or consumption. Cooling may be facilitated prior to pouring by circulating cool water in the jacket of the mixing vessel. Cooling may be completed after packing by holding the product initially at ambient and then completed in a chilled room or chamber.

It is also envisaged that all or parts of Bags 1 and 2 can be added to the mixer without the addition of water. Heat is applied via the jacket of the vessel and mixing commenced. Once the melted fat or oil has coated the non-fat constituents, (formed a roux-like emulsion) water may be added and processing continues to the cooking and pasteurisation stages.

The hot molten mass is cooled by circulating cool water through the water jacket of the vessel. Once the mass attains a temperature of between about 25° and 40°C, all, or part of, the contents of Bags 3 to 8 may be added as necessary. Further mixing continues to fully incorporate these ingredients. The product is then poured into vessels of the

processor's choice. Preferably the packed product is placed in chilled storage to cool further, and set-up prior to sale, dispatch or consumption.

However, for the production of specific food products, Bags 3 or 4 may be added prior to the heating stage.

For the production of other specific food products, any of Bags 5 to 8 may be added prior to the cooking or pasteurisation stages.

The requisite set of bags can be consolidated into a unit package to provide all the necessary constituents, apart from water, for the preparation of a defined quantity of a specified product. An array of products can be offered via a selection of unit packs for the convenience of the manufacturer or consumer who thereby has the ability to readily select or change products with minimal fuss.

This invention gives manufacturers of recombined natural cheese and cheese-type products and recombined food products an efficient and reliable process for their production. In addition, little know-how is required to produce the final products from the specified ingredients in the present invention. The technology utilized in the method requires little more than an agitator. A further advantage is that there is little or no waste stream from the method, i.e. when 1kg of ingredients and solvent is added together, 1kg of product results. The resulting products have similar consistencies, textures and tastes of similar preprepared products bought from "off the shelf".

EXAMPLES

The following are examples of food products that can be made in accordance with the present invention. These formulations were found to have similar consistencies, textures and tastes to similar products bought pre-prepared "off the shelf". The examples are directed to 1 kilogram batches of food product. It is understood that a person skilled in the art could easily create differing batch volumes based on the information provided in the examples.

Example 1

Yoghurt	Ingredients	Quantity (gm)
Bag 1	MPC (42% protein)	80
	Cream powder (70% fat)	51
	Sucrose	55
	Emulsifying agent	4.5
	K sorbate	2
Bag 2	GDL	17.8
Water		789.7
Total		1000

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Example 2

Fresh white cheese	Ingredients	Quantity (gm)
Bag 1	MPC (70% protein)	230.5
	Powdered vegetable fat (hydrogenated)	195
	Carageenan	1
Bag 2	NaCl	11.5
	$CaCl_2.2H_2O$	0.16
	K sorbate	1.0
	GDL	4.6
	Rennet powder	0.08
Water		556.16
Total		1000

Example 3

Cheese spread	Ingredients	Quantity (gm)
Bag 1	MPC (70% protein)	107
	Cream powder (70% fat)	204
	Lactose monohydrate	64
	Carageenan	0.9
Bag 2	Citric acid	8.5
	$Na_2HPO_4.2H_2O$	6
	K sorbate	1
	Salt	8
	Enzyme modified cheese	10
Water		590.6
Total		1000

Example 4

Sweet spread	Ingredients	Quantity (gm)
Bag 1	MPC (70% protein)	107
	Cream powder (70% fat)	204
	Sucrose	64
	Carageenan	0.9
Bag 2	Citric acid	8.5
	$Na_2HPO_4.2H_2O$	6
	K sorbate	1
	Strawberry flavour	1
	Salt	2.5
Water		605.1
Total		1000

5 **Example 5**

Hard cheese	Ingredients	Quantity (gm)
Bag 1	MPC (85% protein)	284.4
	Cream powder (70% fat)	290.8
	Enzyme modified cheese powder	24.5
Bag 2	NaCl	13.1
	Lactic acid anhydride	11.4
	$Na_2HPO_4.2H_2O$	16.3
Water		359.5
Total		1000

Example 6

Stretchable cheese	Ingredients	Quantity (gm)
Bag 1	Skim milk cheese powder (10% moisture)	222.4
	Cream powder (70% fat)	222.4
	Whey protein concentrate (80% protein)	33.5
Bag 2	Na_3 citrate	19.6
	NaCl	7.8
Water		491.9
Total		1000

Example 7

Nutrition bar	Ingredients	Quantity (gm)
Bag 1	MPC (85% protein)	53
	Rennet casein	140
	Cream powder (70% fat)	165
	Whey protein isolate	30
Bag 2	$Na_2HPO_4.2H_2O$	17
	Sucrose	15
	Citric acid	6.8
	Cocoa powder	29
	Chocolate flavour	3.5
Bag 3	Golden syrup	180
	Honey	15
Water		345.7
Total		1000

Example 8

Cream cheese	Ingredients	Quantity (gm)
Bag 1	MPC (85% protein)	31.2
	Cream powder (70% fat)	421.9
	Locust bean gum	2
	Carageenan	0.5
Bag 2	$Na_2HPO_4.2H_2O$	5
	Salt	8.1
	GDL	18.8
Water		512.5
Total		1000

Example 9

Mousse	Ingredients	Quantity (gm)
Bag 1	MPC (85% protein)	48
	Cream powder (70% fat)	310.4
	Sucrose	43.6
	Locust bean gum	3.8
Bag 2	$Na_2HPO_4.2H_2O$	5.1
	Citric acid	7.6
Water		581.5
Total		1000

Example 10

Petite suisse	Ingredients	Quantity (gm)
Bag 1	MPC (56% protein)	71.9
	WPC (80% protein)	16
	Cream powder (70% fat)	81.9
	Sucrose	99.8
	Carageenan	0.2
Bag 2	GDL	18
Water		712.2
Total		1000

Example 11

Cheese spread	Ingredients	Quantity (gm)
Bag 1	MPC (70% protein)	109
	Cream powder (70% fat)	350
	Enzyme modified cheese powder 1	5
	Enzyme modified cheese powder 2	26.6
	NaCl	9.9
	Melting salts	9.9
Water		489.6
Total		1000

References

Christensen P. (1988) Recombined cheese. North European food and dairy journal. 3, 99-105.

Davis, J.G. (1980) Cheesemaking without liquid milk. Dairy Industries International, 45, 7-15.

Gilles J. (1984) The manufacture of white cheese using high total solids recombined milk. New Zealand Journal of Dairy Science and Technology. 19, 1, 37-42.

Omar, M.M. & Buchheim W. (1983) Composition and microstructure of soft brine cheese made from instant whole milk powder. Food Microstructure, 2, 43-50.

Peters, K.H. & Knoop, A.M. (1975) The manufacture of Camembert from mixtures of dry and fresh milks. Milchwissenschaft 30, 205-209.

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